temperature variation across the electrode is "by making the electrode thicker than conventional electrodes" (emphasis added). A "conventional 0.25 inch thick electrode" (emphasis added) is described at page 13, line 21 of the specification. Reading the specification as a whole, it clearly discloses that the electrode can be made thicker than a conventional 0.25 inch thick electrode in order to enhance reduction of the center-to-edge temperature variation across the electrode. The specification further describes at page 13, lines 19-20, "for example, the electrode can have an increased thickness of 0.375 or even 0.50 inch compared to a conventional 0.25 inch thick electrode". Accordingly, Applicants have provided a written description of an electrode having a thickness greater than a conventional 0.25 inch electrode, and have also given specific examples of a 0.375 inch and a 0.5 inch electrode thickness. Thus, Applicants are entitled to claim an electrode thickness range of greater than 0.25 inch to 0.5 inch.

At page 15 of the Official Action, it is alleged that "[s]ince it is clear that the range of 0.375-0.5 inches is greater than a conventional 0.25 inches electrode, the examiner contends that if it was desired to claim any other range besides 0.375-0.5 inches then it would have been stated in the specification" (emphasis added). However, MPEP § 2163.02 explains that the subject matter recited in a claim need not be described literally (i.e., verbatim) in the specification in order for the disclosure to satisfy the written description requirement. Thus, it is improper for the Official Action to ignore the Patent Office examination procedures and allege that the exact language of Claim 1 must be literally described in the specification to satisfy the written description requirement.

Furthermore, U.S. Patent No. 5,074,456 to Degner et al. ("Degner") is incorporated by reference in the present application at page 6, lines 28-29 of the specification. The incorporated material includes the statement at column 4, lines 32-34: "[t]he thickness of the [electrode] will be in the range of from about 0.1 cm to 2 cm, usually being in the range from about 0.3 cm to 1 cm." The range of 0.3 to 1 cm corresponds to 0.12 to 0.4 inch. In TABLE 2 at column 5, Degner discloses an electrode assembly 10 with a dimension t_1 having a range of 0.1-2 cm (0.04-0.79 inch). As shown in FIG. 2A of Degner, the dimension t_1 is the thickness of the electrode plate 12. As the present specification incorporates Degner's disclosure, the specification discloses Degner's electrode thicknesses of 0.04 to 0.79 inch and 0.12 to 0.4 inch, thus supporting the claimed range of 0.3 to 0.5 inch. Therefore, the specification satisfies the written description requirement with respect to the subject matter of Claim 1.

For the above reasons, it is respectfully submitted that the specification provides a written description of the subject matter recited in Claim 1 that meets the requirements of 35 U.S.C. § 112, first paragraph. Withdrawal of the rejection is therefore respectfully requested.

Claims 1, 4-10, 21, 23, 25 and 27-30 were rejected in the Official Action under 35 U.S.C. § 103(a) over Degner in view of JP 2-20018 ("Murai"). The reasons for the rejection are stated at pages 3-5 of the Official Action.

Claim 1 recites a low resistivity silicon electrode, which comprises "a silicon electrode comprising a showerhead electrode having a plurality of gas outlets arranged to distribute process gas in the plasma reaction chamber during use of the showerhead

electrode, the electrode having a thickness of about 0.3 inch to 0.5 inch and an electrical resistivity of less than 1 ohm-cm, . . . the surface being exposed to plasma in the plasma reaction chamber during use of the electrode" (emphasis added). That is, the low resistivity silicon electrode recited in Claim 1 provides a combination of features, including a thickness of about 0.3 inch to 0.5 inch and an electrical resistivity of less than 1 ohm-cm, which together unexpectedly can reduce center-to-edge temperature across the electrode and thereby obtain better process uniformity (page 13, lines 15-19 of the specification).

The Official Action acknowledges that Degner does not suggest that the electrode 12 is a single crystal silicon electrode having an electrical resistivity of less than 0.05 ohm-cm, as recited in Claim 1. However, it is alleged that Murai discloses a single crystal electrode having an electrical resistivity of less than 0.05 ohm-cm. The Official Action asserts that it would have been obvious to modify the apparatus of Degner to comprise an electrode having an electrical resistivity of less than 0.05 ohm-cm. Applicants respectfully disagree with these assertions for the following reasons.

Degner discloses that "the thickness and other dimensions of the electrode plate are not critical and will be selected based on the dimensions of the reactor, cost of the material, machinability of the material, material erosion rate, and the like" (col. 4, lines 21-25). However, Degner does not suggest that selecting any particular electrode plate thickness within the broad range of 0.04-0.79 inch may affect the reduction in center-to-edge temperature variation across the electrode. Rather, Degner discloses electrode plate selection factors that are unrelated to the problem of enhancing the reduction in center-to-edge temperature variation across the electrode. In fact, the selection factors do not

necessarily relate to the electrode plate thickness. Accordingly, one skilled in the art would not have been motivated by Degner's disclosure to select an electrode thickness of about 0.3 inch to 0.5 inch to address the problem that the recited electrode thickness addresses.

Murai also does not suggest an electrode having the combined features of (i) a thickness of about 0.3 inch to 0.5 inch and (ii) an electrical resistivity of less than 1 ohm-cm. Murai does not disclose the thickness of the electrode, and thus provides no suggestion to select the particular thickness of Degner's electrode plate of about 0.3 inch to 0.5 inch, and then to modify Degner's electrode plate having that thickness to have an electrical resistivity of less than 1 ohm-cm, as recited in Claim 1.

The Official Action asserts that it would have been obvious to modify Degner's electrode plate in view of Murai "because such electrode structure is known to be suitable to be used in a plasma apparatus." However, the mere fact that references can be combined is insufficient to render the resultant combination obvious; rather, the prior art itself must also suggest the desirability of the combination. In re Fritch, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992). Degner and Murai do not suggest the desirability of the combination of features recited in Claim 1.

Moreover, the position taken in the Official Action ignores unexpected advantages that result from the combination of features recited in Claim 1, but are not suggested by the cited references. The unexpected results achieved by the combination of features recited in Claim 1 rebut any alleged *prima facie* case of obviousness over Degner and Murai. Accordingly, it is respectfully submitted that Claim 1 is patentable over Degner and Murai.

Claims 4-10, 21, 23, 25 and 27-30 depend from Claim 1 and thus are also patentable over Degner and Murai for at least the same reasons as those for Claim 1. For example, Claim 30 recites an electrode thickness of about 0.375 to 0.5 inch, which also is not suggested by Degner and Murai.

Withdrawal of the rejection is therefore respectfully requested.

Claim 3 was rejected in the Official Action under 35 U.S.C. § 103(a) over Degner in view of Murai and further in view of U.S. Patent No. 5,993,597 to Saito et al. ("Saito"). The reasons for the rejection are stated at page 5 of the Official Action. The rejection is respectfully traversed for the following reasons.

Claim 3 recites the feature of "the gas outlets have diameters of 0.020 to 0.030 inch and the gas outlets are distributed across the exposed surface". It is acknowledged in the Official Action that Degner and Murai fail to disclose the diameter of the gas outlets as recited in Claim 3. However, it is alleged that Saito discloses this feature and that it would have been obvious to modify Degner's electrode plate to have the gas outlets as recited in Claim 3.

However, for the reasons stated in the Amendment After Final Rejection, Saito fails to suggest an electrode thickness of about 0.3 inch to 0.5 inch, or that a low resistivity electrode can reduce center-to-edge temperature variation across the electrode, thereby providing better process uniformity, and that making the electrode thicker than a conventional electrode thickness enhances such reduction of the center-to-edge temperature variation across the electrode. In contrast, Saito's electrode is thinner than a conventional 0.25 inch electrode. Thus, Saito teaches away from the combination of features recited in

Claim 3. Therefore, dependent Claim 3 also is patentable over Degner, Murai and Saito for at least the same reasons as for Claim 1.

Withdrawal of the rejection is therefore respectfully requested.

Claims 1, 4-10, 21, 23, 25 and 27-30 were rejected in the Official Action under 35 U.S.C. § 103(a) over Murai in view of Degner. The reasons for the rejection are stated at pages 5-8 of the Official Action. The rejection is respectfully traversed for the following reasons.

It is acknowledged in the Official Action that Murai fails to suggest an electrode having a thickness of about 0.3 to 0.5 inches, and that the silicon electrode is a showerhead. However, it is asserted that it would have been obvious to modify Murai's electrode in view of Degner to achieve the combination of features recited in Claim 1. Applicants respectfully disagree with these assertions for the following reasons.

Murai discloses an apparatus including an upper electrode 2a and a lower electrode 2b. Doping gas is supplied into the chamber 5 through a gas supply tube 4, flows between the electrodes in a laminar flow or diffusion, and is discharged from a discharge tube 6. Degner, in contrast, discloses a showerhead electrode assembly 10. The asserted modification of the Mukai apparatus would require substantial reconstruction and redesign of the apparatus and change its principle of operation. As stated at MPEP § 2143.01, page 2100-125, "[i]f the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious". For this reason

also, Degner provides no suggestion to modify the Murai apparatus to achieve the electrode recited in Claim 1. See also In re Ratti, 123 USPQ 349, 352 (CCPA 1959).

Modifying Murai's silicon electrode by making it thicker in view of Degner would still result in a silicon electrode that is not a silicon electrode comprising a showerhead electrode, as recited in Claim 1.

In addition, Degner provides no motivation to modify Murai's silicon electrode to have the recited thickness of about 0.3 inch to 0.5 inch in combination with the recited electrical resistivity of less than 1 ohm-cm. Furthermore, the unexpected results which are achieved by the combination of features recited in Claim 1 rebut any alleged *prima facie* case of obviousness over Degner and Murai. Accordingly, it is respectfully submitted that Claim 1 also is patentable over Murai and Degner. Therefore, withdrawal of the rejection is respectfully requested.

Claims 4-10, 21, 23, 25 and 27-30 depend from Claim 1 and thus are also patentable over Murai and Degner for at least the same reasons as those for Claim 1.

Withdrawal of the rejection is therefore respectfully requested.

Claim 3 was rejected in the Official Action under 35 U.S.C. § 103(a) over Murai in view of Degner and further in view of Saito. The reasons for the rejection are stated at pages 8-9 of the Official Action. The rejection is respectfully traversed for the following reasons.

As explained above, Saito does not suggest a low resistivity electrode that can reduce center-to-edge temperature variation across the electrode, thereby providing better process uniformity, and that making the electrode thicker than a conventional electrode

thickness enhances such reduction of the center-to-edge temperature variation across the electrode. Saito also provides no motivation to modify Murai's electrode to achieve the combination of features recited in Claim 1, including an electrode thickness of about 0.3 inch to 0.5 inch. Therefore, dependent Claim 3 also is patentable over Murai, Degner and Saito for at least the same reasons as for Claim 1.

Withdrawal of the rejection is therefore respectfully requested.

Claims 1, 3-10, 21, 23, 25 and 27-30 were rejected in the Official Action under 35 U.S.C. § 103(a) over Saito in view of Degner. The reasons for the rejection are stated at pages 9-12 of the Official Action. The rejection is respectfully traversed for the following reasons.

As acknowledged in the Official Action, Saito does not suggest an electrode having a thickness of about 0.3 to 0.5 inches. Degner fails to cure the deficiencies of Saito with respect to the low resistivity silicon electrode recited in Claim 1. Particularly, Degner does not suggest modifying Saito to provide a silicon electrode having both an electrical resistivity and thickness as recited in Claim 1. Saito and Degner provide no suggestion that the claimed combination would result in improved reduction of center-to-edge temperature variation in a silicon electrode. Thus, Claim 1 is patentable over Saito and Degner. Dependent Claims 3-10, 21, 23, 25 and 27-30 also are patentable over the cited references for at least the same reasons as those for Claim 1. Therefore, withdrawal of the rejection is respectfully requested.

Claims 1, 3-10, 21, 23, 25 and 27-30 were rejected in the Official Action under 35 U.S.C. § 103(a) over Degner in view of Saito. The reasons for the rejection are stated at

pages 12-14 of the Official Action. The rejection is respectfully traversed for the following reasons.

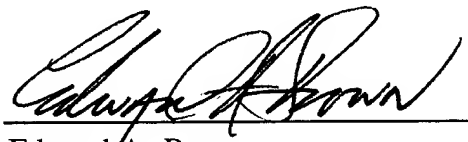
As acknowledged in the Official Action, Degner does not suggest an electrode having an electrical resistivity of less than 0.05 ohm-cm. However, as explained above, Degner also does not suggest the electrode thickness recited in Claim 1.

Saito does not suggest modifying Degner's electrode plate to provide a silicon electrode having both an electrical resistivity and thickness as recited in Claim 1. Degner and Saito provide no suggestion that the claimed combination would result in improved reduction of center-to-edge temperature variation in a silicon electrode. Thus, Claim 1 is patentable over Degner and Saito. Dependent Claims 3-10, 21, 23, 25 and 27-30 also are patentable over the cited references for at least the same reasons as those for Claim 1. Therefore, withdrawal of the rejection is respectfully requested.

For the foregoing reasons, withdrawal of the rejections and prompt allowance of the Application are respectfully requested.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: 

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